DOCUMENT RESUME

ED 073 236 VT 018 573

AUTHOR	Sorenson, Warren
TITLE	A Proposed System for Predicting Costs of Vocational Education Programs in the California Community Colleges. Final Report.
INSTITUTION	West Valley Joint Community Coll. District, Santa Clara, Calif.
SPONS AGENCY	California Coordinating Unit for Occupational Research and Development, Sacramento.
PUB DATE	Jun 72
NOTE	104p.
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	*Community Colleges; Cost Effectiveness; Educational Background; Educational Finance; Educational Programs; Expenditure Per Student; Federal Aid; Post Secondary Education; *Predictor Variables; *Program Costs; Research Needs; Resource Materials; *Vocational Education
IDENTIFIERS	*California

ABSTRACT

The overall purpose of this study was to develop a system for predicting current instructional costs of vocational education programs at the community college level in California. Data gathered by analyzing the instructional expenditures of 19 community colleges for the fiscal year 1969 showed that: (1) Neither of two suggested mathematical formulas could accurately predict vocational program costs, (2) Expenses for similar programs vary widely according to the college, (3) Distributive education and home economics programs required less funding than non-vocational programs, while five other occupational areas required more, and (4) The size of student enrollment affected the cost per student. Minimum vocational program enrollments and identification of expenditures should be established for community colleges, and distribution of federal vocational education funds should consider student enrollment, types of programs, and the development of cost effectiveness data for planning purposes. Further cost studies for vocational education are recommended. Historical background information on federal support to vocational education is included, in addition to comparisons of program costs and institutional characteristics. Numerous tables and appended resource materials are provided. (AG)

FILMED FROM BEST AVAILABLE COPY

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRO
DUCED EXACTLY AS RECEIVED FROM
THE PERSON OR ORGANIZATION ORIG
INATING IT. POINTS OF VIEW OR OPIN
IONS STATED DO NOT NECESSARILY
REPRESENT OFFICIAL OFFICE OF EDU
CATION POSITION OR POLICY

ED 073236

WEST VALLEY JOINT COMMUNITY
COLLEGE DISTRICT

A PROPOSED SYSTEM FOR PREDICTING COSTS OF VOCATIONAL EDUCATION PROGRAMS IN THE CALIFORNIA COMMUNITY COLLEGES

JUNE
1972

VT018573

M E M O R A N D U M

TO: The ERIC Clearinghouse on Vocational and Technical Education
The Ohio State University
980 Kinnear Road
Columbus, Ohio 43212

FROM: (Person) California RCU (Agency) Calif. State Dept. of Ed.

(Address) 721 Capitol Mall, Sacramento, California 95814

DATE: January 5, 1973

RE: (Author, Title, Publisher, Date) Sorenson, Warren, "A Proposed System for Predicting Costs of Voc'l Education Programs In the California Community Colleges", 1972

Supplementary Information on Instructional Material

Provide information below which is not included in the publication. Mark N/A in each blank for which information is not available or not applicable. Mark P when information is included in the publication. See reverse side for further instructions.

(1) Source of Available Copies:
Agency ERIC only
Address
Limitation on Available Copies Price/Unit
(quantity prices)

(2) Means Used to Develop Material:
Development Group P
Level of Group P
Method of Design, Testing, and Trial P

(3) Utilization of Material:
Appropriate School Setting P
Type of Program P
Occupational Focus N/A
Geographic Adaptability P
Uses of Material P
Users of Material P

(4) Requirements for Using Material:
Teacher Competency N/A
Student Selection Criteria N/A
Time Allotment N/A

Supplemental Media -- N/A
Necessary) (Check Which)
Desirable)

Describe

Source (agency)
(address)

ED 073236

FINAL REPORT

RESEARCH PROJECT NO. 43-69716-AB23-020-71

SUPPORTED BY CRCU SMALL GRANT PROJECT

CALIFORNIA STATE DEPARTMENT OF EDUCATION

DIVISION OF VOCATIONAL EDUCATION

UNDER PUBLIC LAW 90-576

A PROPOSED SYSTEM FOR PREDICTING COSTS OF VOCATIONAL EDUCATION PROGRAMS IN THE CALIFORNIA COMMUNITY COLLEGES

WEST VALLEY JOINT COMMUNITY COLLEGE DISTRICT

By

Warren Sorenson

June, 1972

TABLE OF CONTENTS

Chapter		Page
1.	INTRODUCTION	1
	THE PROBLEM	1
	Statement of the Problem	1
	Purpose of the Study	3
	Limitations of the Study	3
	DEFINITION OF TERMS	4
	RELATED STUDIES	7
	ORGANIZATION OF THE STUDY	10
	Data Selection	11
	Data Gathering	11
	Data Analysis	14
	Statistical Analysis	17
	Institutional Characteristics	18
2.	BACKGROUND AND DEVELOPMENT OF FEDERAL SUPPORT AND FINANCING OF VOCATIONAL EDUCATION	19
	HISTORICAL BACKGROUND	19
	Smith-Hughes Act--1917	20
	George-Reed Act--1930	20
	George-Ellzey Act--1934	22
	George-Deen Act--1936	22
	George-Barden Act--1946	24
	The Vocational Education Act--1963	24
	The Vocational Education Amendments of 1968	26

Chapter Page

SUMMARY OF FEDERAL SUPPORT TO VOCATIONAL EDUCATION . . . 26

3. THE STUDY 29

CURRENT INSTRUCTIONAL COSTS 29

Agriculture 29

Distributive Education 31

Health Programs 32

Home Economics 32

Office Education 35

Technical Education 35

Trades and Industry Education 37

COMPARISON OF NON-VOCATIONAL COSTS TO VOCATIONAL PROGRAM COSTS 39

COST PREDICTORS 42

INSTITUTIONAL CHARACTERISTICS 54

Agriculture Education 58

Distributive Education 60

Health Education 60

Home Economics 61

Office Education 62

Technical Education 62

Trades and Industry 63

4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 64

SUMMARY 64

CONCLUSIONS 66

RECOMMENDATIONS 68

BIBLIOGRAPHY 70

Chapter Page

APPENDIXES 76

A. Institutional Data Form 77

B. Institutional Vocational Program Cost Form 78

C. Weekly Student Contact Hour Data Form, 1969-70 79

D. Occupational Programs in Agriculture 80

E. Occupational Programs in Distributive 81

F. Occupational Programs in Health 82

G. Occupational Programs in Home Economics 84

H. Occupational Programs in Office 85

I. Occupational Programs in Technical 87

J. Occupational Programs in Trades and Industry 89

LIST OF TABLES

Table		Page
1.	Annual Appropriation Under the Smith-Hughes Act	21
2.	Annual Appropriation Under the George-Reed Act	22
3.	Annual Appropriation Under the George-Ellzey Act	23
4.	Annual Appropriation Under the George-Deen Act	23
5.	Annual Appropriation Under the George-Barden Act	25
6.	Vocational Education Act of 1963	26
7.	Vocational Education Allotments, Fiscal Years 1970-1971	27
8.	Chronological Listing of Federal Support to Vocational Education	28
9.	Instructional Costs	30
10.	Agriculture Program Expenditure Summary	31
11.	Distributive Education Program Expenditure Summary	33
12.	Health Program Expenditure Summary	34
13.	Home Economics Program Expenditure Summary	35
14.	Office Program Expenditure Summary	36
15.	Technical Program Expenditure Summary	37
16.	Trades and Industry Program Expenditure Summary	38
17.	Summary of Average Daily Attendance Generated by Each College	40
18.	Actual Program Costs Per Unit of Average Daily Attendance by College	41
19.	Summary of Average Instructor Weekly Student Contact by Program Area	44
20.	Actual and Predicted Cost for Agriculture Programs	47
21.	Actual and Predicted Cost for Distributive Programs	48

Table Page

22. Actual and Predicted Cost for Health Programs 49

23. Actual and Predicted Cost for Home Economics Programs . . . 50

24. Actual and Predicted Cost for Office Programs 52

25. Actual and Predicted Cost for Technical Programs 53

26. Actual and Predicted Cost for Trades and Industry Programs. 55

27. Rank Order of Institutional Characteristics 57

28. Rank Order by Program Expenditure and ADA 59

LIST OF FIGURES

Figure Page

1. Geographic Distribution of Community Colleges 12

Chapter 1

INTRODUCTION

For more than half a century, the United States Congress has demonstrated an increasing interest in vocational education. With the enactment of the Smith-Hughes Act in 1917, Congress authorized the expenditure of federal funds to support vocational education programs at the local school level. (38) This act created a unique partnership between federal, state, and local education agencies. The Smith-Hughes Act established a rigid categorical aid system in which federal support was limited to vocational education programs for specific occupations.

The Vocational Education Act of 1963 (Public Law 88-210), authorized increased federal support to vocational education. (28) This legislation broadened the base for federal support to vocational education programs and removed the specific occupational categories as imposed by the Smith-Hughes Act.

The 1968 Amendments to the Vocational Education Act of 1963 further increased the authorization of federal support to vocational education. (27) Additionally, this legislation brought a number of new dimensions to the distribution of federal funds for vocational education to local school districts. (27)

THE PROBLEM

Statement of the Problem

During this decade, legislators and their constituents use the

term "accountability" with increasing frequency. The 1968 Amendments to the Vocational Education Act of 1963 brought this fact to the attention of vocational educators. This legislation calls for the allocation of federal funds to give consideration to excess cost. Part B of the 1968 Amendments, which provides fiscal support for programs, services, and activities in vocational education, specifies that:

> (a) In allocating funds among local educational agencies, the State Board shall give due consideration to the cost of the program, services and activities these local educational agencies provide which is in excess of the cost which may be normally attributed to the cost of education in such educational agencies. (27)

A second dimension created by the 1968 Amendments was that of vocational program planning. In addition to requiring the development of an annual program plan by each participating state and local educational agency, the Act mandates that all participating agencies must develop a program plan that extends for not more than five years or less than three years. (27)

A problem central both to determining excess program costs and to program planning is identifying actual program costs of vocational education programs. Typically, vocational education programs are provided at grades eleven and twelve at the high school level and at grades thirteen and fourteen at the community college level.

This study is a response to several questions raised by the 1968 Amendments to the Vocational Education Act of 1963. After answering these questions, one postulates that more meaningful program planning can be undertaken by administrators in California community colleges than had been effected before the 1968 Amendments came into existence.

Purpose of the Study

The purpose of this study was to develop a system or method for predicting current instructional costs of vocational education programs as conducted by the community colleges of California.

Specifically, this study sought to answer the following questions:

1. Do all vocational education programs generate an excess cost when compared to non-vocational programs?

2. Is it possible to develop a method for predicting current instructional costs of vocational education programs?

3. Are there identifiable institutional characteristics that contribute to the excess cost of vocational education programs?

4. Is the cost of similar vocational programs conducted by different community colleges the same?

5. What is the average cost of vocational education programs when compared to non-vocational program costs?

Limitations of the Study

The following statements define the limits of this study:

1. All data used was for the fiscal year 1969-70.

2. Only programs conducted by California community colleges were studied.

3. The study used only current instructional costs.

4. Only data from twenty-four selected California community colleges were analyzed.

DEFINITION OF TERMS*

Agriculture Education. An instructional program comprised of the group of related courses or units of subject matter which are organized for carrying on learning experience concerned with preparation for or upgrading in occupations requiring knowledge and skills in agricultural subjects. The functions of agricultural production, agriculture supplies, agricultural mechanization, processing, ornamental horticulture, forestry, agricultural resources, and that which is related to those functions, are emphasized in the instructional program.

Average Daily Attendance (ADA). A unit of average daily attendance is 525 contact hours of enrollment per academic year, or three contact hours of enrollment per day for the minimum required 175 days of school, or fifteen contact hours of enrollment per week for thirty-five weeks.

Contact Hour, Weekly Student (WSCH). The weekly student contact hour is the basic student unit for measuring space needed and for determining financial support for students in credit classes. It is the fifty to sixty minute sessions each week for which a student is enrolled and will be occupying a student station in a classroom, seminar room, or teaching laboratory. By multiplying the number of hours each class meets per week by the number of students in the class and totaling these products, the load of a faculty member is determined. This load is expressed as weekly student contact hours.

---

*Adapted from Standard Terminology for Curriculum and Instruction in Local and State School Systems, U. S. Office of Education, Handbook VI, 1969.

Current Instructional Cost. Current instructional costs are those costs which fall into the following expenditure categories: director's salary; classified salaries; other expenses of director; supervisors' salaries; instructors' salaries; other certificated salaries of instruction; classified salaries of instruction; textbooks; and other expenses of instruction.

Distributive Education. Instruction that includes various combinations of subject matter and learning experiences related to the performance of activities that direct the flow of goods and services, including their appropriate utilization, from the producer to the consumer or user. These activities include selling and such sales-supporting functions as buying, transporting, storing, promoting, financing, marketing research, and management.

Excess Cost. Excess cost is the cost of programs, services and activities which is in excess of the cost which may be normally attributed to the cost of education in each community college.

Health Occupations Education. Education for health occupations comprises the body of related subject matter, or the body of related courses, and planning experience designed to impart knowledge and to develop the understanding and skills required to support the health professions. Instruction is organized to prepare pupils for occupational objectives concerned with assisting qualified personnel in providing diagnostic, therapeutic, preventive, restorative, and rehabilitative services to people.

Home Economics Education. A group of related courses or units of related courses or units of instruction organized for purposes of enabling pupils to acquire knowledge and to develop understanding, attitudes, and skills relevant to personal, home, family life, and occupational preparation using the knowledge and skills of home economics. The subject matter of home economics includes, in addition to that which is unique to the area, concepts drawn from the natural and the social sciences and the humanities.

Office Occupations Education. A body of subject matter, or combination of courses and practical experience, which is organized into programs of instruction to provide opportunities for students to prepare for or advance in selected office occupations. These educational experiences usually include a variety of activities, such as recording and retrieval of data, supervision and coordination of office activities, internal and external communication, and the reporting of information.

Technical Education. Instruction which is concerned with that body of knowledge organized in a planned sequence of classrooms and laboratory experience to prepare students for a cluster of job opportunities in a specialized field of technology. The program normally includes the study of the underlying sciences and supporting mathematics inherent in a technology, as well as methods, skills, meterials, and processes commonly used and services performed in the technology.

Trade and Industrial Education. Instructional programs which are concerned with preparing persons for initial employment, or for upgrading or retraining workers in a wide range of trade and industrial

occupations. Such occupations are skilled or semi-skilled and are concerned with layout designing, producing, processing, assembling, testing, maintaining, servicing, or repairing the product or commodity. Instruction is provided in basic manipulative skills, safety judgment, and related occupational information in mathematics, drafting, and science required to perform successfully in the occupation.

RELATED STUDIES

This study was concerned with identifying the current instructional costs of vocational education programs conducted in the community colleges of California. Also, the study directed itself to establishing a means or system for predicting costs of vocational programs. Currently, community college budgets are developed and costs are identified by function. The California School Accounting Manual lists seven functional budget categories to which current costs may be charged. These budget categories are: administration, instruction, health services, pupil transportation, operation of plant, maintenance of plant, and fixed charges. (17:57)

A review of the literature describing the costs of vocational education indicated a lack of data and research in that area. Only recently have researchers dealt with this problem. William P. McLure mentioned this problem when discussing federal support to vocational education. He reports that expenditures are not reported for instruction in any vocational field which does not receive federal reimbursement. (13) The President's Panel of Consultants on Vocational Education in 1963 stated that the lack of data and tangible evidence makes it

difficult to evaluate the national program of vocational education. (21:207) Ross, et al, reported that, because of the lack of data on state fiscal support funds to junior colleges for vocational-technical education, it was impossible to include junior colleges in their study. (39:233) The 1968 General Report of the Advisory Council on Vocational Education discussed the limitations for projecting financial needs. They listed the major limiation as being the lack of data related to the actual costs of vocational education. (42:146)

The continued use of PPBS (Program, Planning, Budget System) undoubtedly will alleviate the problem of identifying vocational education program costs. Heinkel and Klimpe have developed a proration formula for determining unit cost. They used three procedures to prorate costs. Some expenditures were prorated directly to the course; most often expenditures were prorated to each class section; and, third, some costs were prorated to student enrollment and them were multiplied by the number of students in each section. Also, they studied cost-effectiveness by determining the cost for each student actually finishing the course. Thus, their study gives consideration to attrition without determining causation. (24)

A study by McLure, et al, concluded in 1960, indicated that the average current cost per non-vocational student was approximately eighty-five percent of the costs per vocational student. The study's focus was seventeen junior colleges. (25)

Keene's study dealt with the Florida junior colleges. He analyzed the current expenditures from fiscal year 1962, and developed a weighting formula for calculating junior college financial needs. The study gave

weight to two factors. These factors are class size and depreciation of equipment. Keene also developed a "scope of opportunity" unit (the number of different courses offered each year). He found that junior colleges with an average daily attendance under 400 were 250 percent more costly; therefore, he concluded that a junior college with an average daily attendance of less than 400 was not economically feasible. (49)

Anderson conducted a study of eight junior colleges to determine the differential among technical curriculums and the liberal arts transfer curriculum. He established a ratio factor of 1.0 for the liberal arts curriculum, and then he made a comparison with the cost of selected technical curricula. His results were as follows: Applied Arts, 1.76; Engineering Technologies, 1.95; Business and Office Occupations, .95; Health and Medical Occupations, 1.49; Industrial-Technical Occupations, 1.52; Home Economics Occupations, 1.21; and Public Service Occupations, .96. Anderson pointed out that a limitation in his study was the lack of necessary records to make an accurate determination of the total cost of each course offered. (1)

Cage conducted a study of costs in area schools of Iowa, two of which were junior colleges. He related student per contact hour costs to several factors, which included enrollment, instructor salaries, instructional supplies, new equipment, and indirect expenses. He established a correlation between cost and several of the factors--instructor salaries being the highest. (6)

Parry's study in North Carolina pointed out that, in comprehensive community colleges of that state, technical education was the most costly, vocational programs the next most costly, and college parallel

the least expensive. He found that cost decreases when enrollment increases. He related curriculum cost to policies at each institution, but, also, found different costs for the same programs at different institutions. (51)

Robertson's study of community colleges produced some interesting results. He qualified institutional environment as it related to program costs. He included courses, sections, instructors, teacher load, and section enrollment in the institutional environment. He found laboratory courses generally to be more expensive. He also found the cost per student hour credit to be almost double in some institutions. Additionally, he demonstrated that single section offerings created an increase in program cost. (52)

Yett conducted a study to determine the cost of vocational homemaking courses in the high schools of California. His study reported that the cost of vocational homemaking classes in 1956 was from zero to forty percent in excess of the average cost of instruction. (43)

In a study of the costs of selected industrial arts programs in San Diego, Heath concluded that the mean excess cost for all schools studied was 27.1 percent above the normal costs per student contact hour. (48.98)

ORGANIZATION OF THE STUDY

Several different sets of data were needed for this study. Data relative to the cost of instruction during the fiscal year 1969-70, at each selected community college, was collected from the Office of the Chancellor, California Community Colleges. Data relative to the cost of

vocational education at the selected community colleges was gathered from the California State Department of Education, Division of Vocational Education.

The average weekly student contact hours generated by instructors in each of the seven vocational education program areas was supplied by the chief vocational education administrative officer at each of the selected community colleges.

The investigation of this study fell into four major phases. These phases were data selection, data gathering, statistical analysis, and analysis of institutional characteristics.

Data Selection

An attempt was made to use data from twenty-four community colleges throughout California as samples for this study. Two community colleges from each of the twelve planning areas, as established by California Senate Bill 1820, Planning Areas for Vocational Education (20), were selected. This assured a geographic spread of the community colleges (see Figure 1, page 12). An additional criterion used for selection of the community colleges to be used as samples was that each college was noted for conducting strong vocational education programs. From each of the twelve planning areas, one small and one large college was selected. Of the twenty-four colleges selected, five were unable to provide data essential to the study.

Data Gathering

Data needed for this study fell into three major categories. These three categories were institutional data, vocational education program cost data, and average instructor-to-student ratio, or weekly

Figure 1

Geographic Distribution
of Community Colleges

student contact hours for each vocational education program, as well as the average instructor-to-student ratio for non-vocational instructors. Appendix A is a sample institutional data form developed for this study. The data from this form, when combined with data from the vocational education program cost form, permitted the determination of the cost per average daily attendance for non-vocational education students at the selected colleges.

The institutional vocational program cost form was developed to correlate with the final claim form as developed by the California State Department of Education, Division of Vocational Education. This is Vocational Education Form VE-2b, which utilizes expenditure categories as defined in the California School Accounting Manual. (17) The expenditures reported on form VE-2b by each school district and used in this study are: 112, director's salary; 120, classified salaries; 192, other expenses of director; 212, supervisors' salaries; 213, teachers' salaries; 214, other certificated salaries; 220, slassified salaries; 230, textbooks; and 290, other expenses of instruction. A vocational program cost form was completed for each vocational education program being conducted by each selected college. (Appendix B furnishes a sample vocational program cost form.) To provide congruency between this study and available fiscal data, the same vocational program categories were used as those used on California State Department of Education form VE-2b. These vocational program categories are: agriculture, distributive, health, home economics (gainful), office, trades, and industry and technical.

The total institutional instructional costs used in this study were taken from form CCAF-301, as reported to the Office of the

Chancellor, California Community Colleges, by each college district. The expenditure categories used were the same as those identified above from from VE-2b, with one exception. No administrative cost for the institution was used while the vocational education directors' expenditures were used to establish the vocational education program costs. The rationale for this decision was based upon the fact that, in order to qualify for participation in federal vocational education funding, the California State Plan for Vocational Education requires each school's district to have a qualified local vocational education director. (18) This is an extraordinary cost, above normal administrative costs, for each community college.

In order to determine the instructor-to-student ratio for each vocational education program, as well as the average ratio for non-vocational instructors in each institution, a survey form was developed (see Appendix C). The instructor-to-student ratio in community colleges is expressed in terms of weekly student contact hours. The weekly student contact hour for each instructor is computed by multiplying the numbers of students in each class section by the number of hours each section meets weekly. The figures derived for each section are then added and the sum is the total weekly student contact hours for each instructor. This figure is most often referred to as WSCH. The survey form was sent to each chief vocational education administrator at each of the selected community colleges. Of the twenty-four selected colleges, nineteen could provide this data.

Data Analysis

The data analysis in this study took several forms. First, the

raw data was processed to determine the actual current cost per average daily attendance for each vocational program in each college. This data permitted a comparison with the current costs for non-vocational instruction in each college. This comparison indicated whether there actually was an excess cost generated by vocational programs.

The second portion of the data analysis dealt with the computation of a program cost factor for each of the seven vocational program areas. Two formulas were developed that utilized the components recommended by Lindman. (25:79) Formula I generated a program cost factor that was a multiplication factor, while Formula II generated a program cost factor that became an add-on factor.

A program cost factor was computed for each vocational program area. The factor developed for Formula I was identified as a P factor. The P factor for each vocational program area was determined by applying mean data to the following formula:

$$\bar{P} = \frac{\bar{C}v}{\bar{C}o} \times \frac{\bar{N}v}{\bar{N}o}$$

Where:

$\bar{C}v$ = mean annual instructional cost per average daily attendance for each vocational Program

$\bar{N}v$ = mean average weekly student contact hour per instructor in the vocational program

$\bar{C}o$ = mean average instructional cost per average daily attendance for non-vocational students

$\bar{N}o$ = mean average weekly student contact hour per non-vocational instructor

$\bar{P}$ = program factor

A mean P factor was computed for each vocational program area. The mean P factor was then used in the program cost prediction formula.

Formula One. The first prediction formula was as follows:

$$Cv = \bar{Co} \times \frac{\bar{No}}{Nv} \times \bar{P}$$

The formula was applied to each vocational program area at each institution. The only variable permitted was the actual average weekly student contact hour in the vocational program, or Nv. An example of the computation for Formula I is:

$$Cv = \bar{P} \times \bar{Co} \times \frac{\overline{WSCH}}{\begin{matrix}\text{WSCH in} \\ \text{Vocational} \\ \text{Program}\end{matrix}}$$

The second formula used was one that generated a vocational program cost factor that was an add-on factor. This factor has been identified as a K factor. To determine the K factor, the following formula was applied to data from each vocational program area at each institution.

$$\bar{K} = \frac{\bar{Cv}}{\bar{Co}} - \frac{\bar{No}}{\bar{Nv}}$$

Where:

$\bar{Cv}$ = mean annual instructional costs per average daily attendance for each vocational program

$\bar{Nv}$ = mean average weekly student contact hour per instructor in the vocational program

$\bar{C}o$ = mean average instructional costs per average daily attendance for non-vocational students

$\bar{N}o$ = mean average weekly student contact hour per non-vocational instructor

$\bar{K}$ = program factor

Thus, a mean K factor was derived for each vocational program area. The following cost prediction formula was then used to predict the cost for each vocational program at each institution:

Formula Two. $$Cv = \bar{C}o \times \frac{\bar{N}o}{Nv} + \bar{C}o \times \bar{K}$$

Again, the only variable used in computation was the weekly student contact hour for each vocational program. Thus, the computation was:

$$Cv = \bar{C}o \times \frac{\overline{WSCH}}{\text{WSCH in Vocational Program}} + \bar{C}o \times \bar{K}$$

Statistical Analysis

The method of least squares was used to determine the usefulness of each prediction formula for each vocational program area. In this method the criteria used for determining the success of a prediction formula is the amount of variance among the actual program costs "explained" by the prediction formula. The amount "explained" is expressed as a percent. The following formula was used:

$$1 - \frac{\text{Sum of the squares of the difference between the actual and predicted cost}}{\text{Sum of the squares of the difference between the actual and the actual mean cost}} = \text{percent of variance "explained"}$$

If the numerator of the equation is larger than the denominator, then the prediction formula has failed.

A more statistically sound method can be employed to determine the relationship among variables; however, the primary purpose of this study was to test prediction formulas that utilized data readily available [illegible] community college districts. Therefore, the prediction formulas were developed for application rather than using a tested mathematical formula such as a regression equation.

Institutional Characteristics

In a study of this nature one could expect to find a wide range of expenditure per average daily attendance for similar vocational programs conducted among the several community colleges being studied. He could further postulate that it would be possible to identify unique institutional characteristics that might contribute either to a hith or to a low cost for a particular vocational program. Some of these institutional characteristics might be: size of the college, geographic location in California, wealth of the district and nature of the community served. These institutional characteristics were identified by an examination of college catalogs and through an interview with each director of vocational education.

Chapter 2

BACKGROUND AND DEVELOPMENT OF FEDERAL SUPPORT AND FINANCING OF VOCATIONAL EDUCATION

HISTORICAL BACKGROUND

Federal support to vocational education began in the early years of the 20th century. In the 19th century, the need for occupational instruction had been met by lyceums, technical institutes, private trade schools, and corporation schools. However, the 20th century's increased rate of transition from an agrarian to an industrial society brought about an awareness of the need for trained workers. Proponents of public education were obliged to give increased attention to providing vocational and technical instruction, particularly in the fields of agriculture, business, the trades, and homemaking. The need for such a program reached such magnitude that it became apparent such a program would have to be supported by public funds. (4)

According to Barlow, the major thrust to find adequate fiscal support was undertaken by a group of industrial educators. (4:52) To achieve their goal, the industrial educators formed the National Society for the Promotion of Industrial Education. Because of this group's efforts, Congress, in 1914, authorized the President of the United States to appoint a commission to study the need for vocational training. (21:20) Thus, the Commission on National Aid to Vocational Education was created. The Commission's charge was to consider the subject of national aid to vocational education and to report their findings and recommendations to

Congress not later than June 1 of the following year. (21:20) As a result of the report of the Commission, the first of a long series of Congressional acts to support vocational education was signed by President Woodrow Wilson in 1917. (21:21)

This first act and subsequent acts have provided continual federal support to vocational education. The various acts and their contributions are:

Smith-Hughes Act--1917

The Smith-Hughes Act provided grants to states for the purpose of promotion of vocational education in specific categories. The grants were to be used for programs in agriculture, trade and industrial education, and home economics. Support also was provided for teacher training. (38)

The Act was to be administered by a Federal Board for Vocational Education. The funds were allocated to the states on a ratio of each state's population to the total United States. A rural population ratio was used for allocation of agriculture funds, while a ratio of urban population was used to allocate both trade and industrial and home economics fiscal support. Table 1 shows the amount appropriated each year under this Act.

George-Reed Act--1930

This Act provided funds for agriculture and home economics. Each state received a portion equal to the ratio of its rural population to the rural population of the United States. (37) The Act was actually a means of supplementing the Smith-Hughes Act for a short term. The Act expired in June of 1934. Table 2 shows the amount allocated each year

Table 1

Annual Appropriation Under the Smith-Hughes Act

Year	Allotment	Year	Allotment	Year	Allotment
1918	$1,655,586.72	1936	$7,157,977.62	1953	$7,273,330.22
1919	2,307,460.44	1937	7,157,977.62	1954	7,273,330.22
1920	3,051,919.01	1938	7,157,977.62	1955	7,273,330.22
1921	3,632,177.37	1939	7,157,977.62	1956	7,273,330.22
1922	4,120,833.72	1940	7,157,977.62	1957	7,273,330.22
1923	4,615,159.82	1941	7,157,977.62	1958	7,273,330.22
1924	5,190,448.02	1942	7,150,122.03	1959	7,296,312.00
1925	6,168,716.08	1943	7,150,122.03	1960	7,274,987.00
1926	7,154,901.51	1944	7,150,122.03	1961	7,266,455.00
1927	7,154,901.51	1945	7,150,122.03	1962	7,266,455.00
1928	7,154,901.51	1946	7,285,122.03	1963	7,266,455.00
1929	7,154,901.51	1947	7,285,122.03	1964	7,266,455.00
1930	7,154,901.51	1948	7,285,122.03	1965	7,266,455.00
1931	7,154,901.51	1949	7,285,122.03	1966	7,266,455.00
1932	7,157,977.62	1950	7,285,122.03	1967	7,266,455.00
1933	6,442,179.81	1951	7,273,330.22	1968	7,266,455.00
1934	5,940,000.00	1952	7,273,330.22	1969	7,266,455.00
1935	7,157,977.62				

under this act.

Table 2

Annual Appropriation Under the George-Reed Act

Year	Allotment
1930	$ 500,000.00
1931	1,000,000.00
1932	1,500,000.00
1933	1,500,000.00
1934	1,275,000.00

George-Ellzey Act--1934

As did the George-Reed Act, this short-term act supplemented the Smith-Hughes Act. This Act replaced the George-Reed Act and provided additional fiscal support to the states for the same categories as identified in the Smith-Hughes Act. (36) The Act authorized an appropriation of $3 million each year for three years. As in the George-Reed Act, the distribution of funds to the states was made on a ratio of a state's population to the United States population. For agriculture, the farm population was used; for home economics, the rural population; and for trades and industry, the non-farm population was used. Table 3 shows the amount allocated each year under this Act.

George-Deen Act--1936

Both of the two preceding short-term Acts demonstrated the legislator's acknowledgement of the need for greater federal support to vocational education. The George-Deen Act became effective in 1937. (35)

Table 3

Annual Appropriation Under the George-Elizey Act

Year	Allotment
1935	$ 3,084,603.00
1936	3,084,603.00
1937	3,084,603.00

This Act contained no expiration date, and, as the two preceding Acts did, it provided support for agriculture, home economics, and trades and industry. Unlike the other Acts, the Act provided support for distributive education programs. Table 4 shows the amount allocated each year under this Act.

Table 4

Annual Appropriation Under the George-Deen Act

Year	Allotment
1938	$12,653,001.18
1939	14,483,000.00
1940	14,483,000.00
1941	14,483,000.00
1942	14,483,000.00
1943	14,483,000.00
1944	14,483,000.00
1945	14,483,000.00
1946	14,483,000.00

George-Barden Act--1946

In August of 1946 Congress approved the George-Barden Act. The funds were to be expended for the same purpose and in the same manner as provided for in the Smith-Hughes Act. (34) Like the Smith Hughes, the Act provided an authorization for distributive occupations. These funds were limited to providing support to programs for employed workers.

Three amendments to the George-Barden Act provided additional support to vocational education programs. In 1956 the Health Amendments Act authorized support to practical nurse training. (33) This Act became Title II of the George-Barden Act. Also in 1956, Congress authorized support to the fishery trades and increased support to the distributive occupations. (32) This Act became an amendment to Title I of the George-Barden Act. in 1958, Congress passed the National Defense Education Act. (31) Title VIII of this Act, which became Title III of the George-Barden Act, provided support to the training of highly skilled technicians in occupations necessary to the national defense. Table 5 illustrates allocations under the George-Barden Act.

The Vocational Education Act--1963

In December, 1963, Congress approved Public Law 88-210, the Vocational Education Act of 1963. This Act proved to be an historical turning point in federal support to vocational education. Each previous act had provided support by narrow occupational categories. The 1963 Act was directed toward meeting the needs of individuals. (28) As the result of this Act, the emphasis in vocational education was providing programs and services for people. The Act stated that, if a training need were discovered, federal funds could be used to provide the necessary training.

Table 5

Annual Appropriation Under the George-Barden Act

Year	Total	Title I	Title II	Title III
1947	$19,842,759.97	$19,842,759.97	$	$
1948	19,842,759.97	19,842,759.97		
1949	19,842,759.97	19,842,759.97		
1950	19,842,759.97	19,842,759.97		
1951	18,988,260.97	18,988,260.97		
1952	18,538,260.68	18,538,260.68		
1953	18,538,260.68	18,538,260.68		
1954	18,538,260.68	18,538,260.68		
1955	23,538,261.00	23,538,261.00		
1956	26,365,000.00	26,365,000.00		
1957	31,307.081.00	29,307,081.00	2,000,000.00	
1958	33,615,081.00	29,615,081.00	4,000,000.00	
1959	37,365,081.00	29,615,081.00	4,000,000.00	3,750,000.00
1960	40,567,081.00	29,567,081.00	4,000,000.00	7,000,000.00
1961	42,567,081.00	29,567,081.00	4,000,000.00	9,000,000.00
1962	46,352,646.00	29,552,646.00	4,000,000.00	12,800,000.00
1963	49,610,823.00	29,610,823.00	5,000,000.00	15,000,000.00
1964	49,610,823.00	29,610,823.00	5,000,000.00	15,000,000.00
1965	49,690,823.00	29,690,823.00	5,000,000.00	15,000,000.00
1966	49,885,823.00	29,885,823.00	5,000,000.00	15,000,000.00
1967	49,885,823.00	29,885,823.00	5,000,000.00	15,000,000.00
1968	49,885,823.00	29,885,823.00	5,000,000.00	15,000,000.00
1969	49,885,823.00	29,885,823.00	5,000,000.00	15,000,000.00

The one exception to this statement was that of the professional occupations; those requiring a baccalaureate or higher degree were excluded. This Act also consolidated all the previous Acts into one allocation. The allocations under this Act are shown in Table 6.

Table 6

Vocational Education Act of 1963

Year	Allotment
1965	$ 5,000,000.00
1966	25,000,000.00
1967	10,000,000.00
1968	10,000,000.00

The Vocational Education Amendments of 1968

The Advisory Council on Vocational Education in 1968 transmitted their report to the Secretary of Health, Education, and Welfare. As a result of this report, the 90th Congress enacted the Vocational Education Amendments of 1968. This Act provided additional support

> . . . to the states to assist them to maintain, extend and improve existing programs of vocational education, to develop new programs of vocational education, and to provide part-time employment for youths who need the earnings from such employment to continue their vocational training on a full-time basis. (27)

The allocations under this Act are shown in Table 7.

SUMMARY OF FEDERAL SUPPORT TO VOCATIONAL EDUCATION

The Congress of the United States first provided federal support

Table 7

Vocational Education Allotments
Fiscal Years 1970-1971

Program	1970	1971
Total	$365,347,455.00	$412,872,583.00
Basic Grants to States	307,497,455.00	321,747,710.00
Consumer and Homemaking	15,000,000.00	21,250,000.00
Cooperative Education	14,000,000.00	18,500,000.00
Innovation	6,500,000.00	8,000,000.00
Special Needs	17,000,000.00	20,000,000.00
Work Study	4,250,000.00	5,500,000.00
Research	1,100,000.00	17,874,873.00

to vocational education in 1917 by the enactment of the Smith-Hughes Act. Continual federal support has been extended since that time. The Smith-Hughes Act and all Acts which followed until 1963 provided assistance in occupational categories. With the enactment of the Vocational Education Act of 1963, support was directed toward meeting the needs of individuals. Vocational education programs could be established to provide training for any occupation except those requiring a baccalaureate or higher degree. Table 8 provides a chronological listing of federal support provided to vocational education.

Table 8

Chronological Listing of Federal Support to Vocational Education

Year	Allotment	Year	Allotment	Year	Allotment
1918	$1,655,586.72	1936	$10,242,580.62	1953	$25,811,590.90
1919	2,307,460.44	1937	10,242,580.62	1954	25,811,590.90
1920	3,051,919.01.	1938	19,810,978.80	1955	30,811,591.22
1921	3,632,177.37	1939	21,640,977.62	1956	33,638,330.22
1922	4,120,833.72	1940	21,640,977.62	1957	38,580,411.22
1923	4,615,159.82	1941	21,640,977.62	1958	40,888,411.22
1924	5,190,448.02	1942	21,633,122.03	1959	44,638,411.22
1925	6,168,716.08	1943	21,633,122.03	1960	47,863,393.00
1926	7,154,901.51	1944	21,633,122.03	1961	49,842,068.00
1927	7,154,901.51	1945	21,633,122.03	1962	53,619,101.00
1928	7,154,901.51	1946	21,768,122.03	1963	56,877,278.00
1929	7,154,901.51	1947	27,127,882.00	1964	56,877,278.00
1930	7,654,901.51	1948	27,127,882.00	1965	168,607,278.00
1931	8,154,901.51	1949	27,127,882.00	1966	241,902,278.00
1932	8,657,977.62	1950	27,127,882.00	1967	265,377,278.00
1933	7,942,179.81	1951	26,273,383.00	1968	265,377,278.00
1934	7,215,000.00	1952	25,811,590.90	1969	255,377,278.00
1935	10,242,580.62				

Chapter 3

THE STUDY

The major objective of this study was to devise a system for predicting costs of vocational education programs being conducted by community colleges in California. The problem was divided into several parts for analysis. Those parts were: (1) calculation of the current instructional costs of programs in agriculture, distribution, health, home economics, office, technical and industrial education; (2) comparison of the current costs of each vocational program to the current costs of non-vocational programs within each school; (3) identification of cost variables which contribute to current program costs and can be utilized as predictors of total program costs; and (4) identification of institutional characteristics influencing vocational education program costs.

CURRENT INSTRUCTIONAL COSTS

Total instructional costs for vocational programs at all colleges are shown in Table 9. The percent of the total current instructional costs devoted to vocational education programs range from a low of 10.08 percent to a high of 25.33 percent among the various institutions. The mean percentage of instructional costs expended on vocational programs was 16.89.

Agriculture

Eight of the colleges in the study offered programs in agriculture

Table 9

Instructional Costs

Institution	Total Current Institutional Instructional Costs	Current Instructional Cost Vocational Education	Percentage Vocational Education of Total
K	$ 10,644,110	$ 1,839,727	17.28
X	7,217,570	1,052,375	14.58
Q	5,164,306	856,799	16.59
D	6,586,697	1,582,136	24.02
V	5,383,886	762,509	14.10
N	4,192,865	1,030,315	24.50
C	5,047,926	509,139	10.08
U	3,870,990	635,969	16.42
F	4,291,024	520,637	12.13
O	3,430,532	554,095	16.15
P	3,950,037	586,702	14.85
W	3,219,195	531,521	16.15
S	3,087,793	781,377	25.30
A	2,835,496	464,381	16.37
T	2,348,747	491,736	20.93
G	1,857,478	338,541	18.22
B	1,678,657	181,166	10.79
I	938,869	236,675	25.20
E	778,631	138,594	17.79
		Mean Total	16.89

of sufficient size to warrant inclusion in the study. Three additional colleges offered one or two courses in the evening college. Data from these colleges did not meet the criteria for inclusion in the study since an offering of one or two courses does not constitute a vocational program. Of the eight colleges whose programs were included in the study, the actual instructional costs per average daily attendance ranged from a low of $592 to a high of $1,217, with a mean of $821. Table 10 presents a summary of the expenditure categories and per average daily attendance costs for agriculture.

Table 10

Agriculture Program Expenditure Summary

Institution	Cost of Adm.	Cost of Super.	Instructor Salary	Class Salary	Inst. Supply	Program Total	Per ADA Costs
K	$1,884	$4,459	$40,572	$12,674	$13,812	$ 74,552	$1,035
X	1,805	8,960	68,099	10,625	23,034	122,815	793
D		672	80,935		4,792	86,399	650
U	640		13,808	66	1,141	16,096	670
S	1,366	500	62,473	21,392	11,465	97,730	664
T	2,883	300	48,324	2,044	26,553	72,074	948
G			58,321	1,250	6,303	66,874	592
E		367	26,070		1,536	27,973	1,217

Distributive Education

Fifteen of the colleges selected for this study offered distributive education programs. One additional college offered distributive education; however, the program was only in the evening college and only

hourly instructors were employed in the program. Data from this college was eliminated from the study. A second college that had just started a program and had low enrollment also was eliminated. The mean instructional costs per average daily attendance for distributive education programs was $482. The range of expenditure was from a low of $265 per average daily attendance to high of $941. The institution with the highest average daily attendance cost had unusually high costs for supervision. Table 11 lists the expenditure categories and per unit of average daily attendance costs by institution.

Health Programs

Of the colleges included in the study, fifteen were conducting programs in the health field. The per average annual daily attendance cost ranged from a low of $498 to a high of $1,303. The mean cost per unit of average daily attendance for all colleges was $964. Health education programs are the most costly of the seven vocational program areas. Two factors have been identified that contribute to this high cost. One is the maximum instructor-to-student ratio mandated by the various state agencies that supervise health training programs. The second is the high supervisory cost which is also mandated by the state agencies. Table 12 provides a listing of the expenditure categories and per average daily attendance costs for each institution conducting programs in health education.

Home Economics

The area of home economics presents unique problems to vocational education administrators throughout the state of California. Many colleges do not claim any of their home economic expenditure as vocational

Table 11

Distributive Education Program Expenditure Summary

Institution	Cost of Adm.	Cost of Super.	Instructor Salary	Class Salary	Inst. Supply	Program Total	Per ADA Costs
K	$1,884	$14,174	$176,313	$10,506	$5,864	$209,892	$ 426
X	1,235	9,719	59,645	1,222	4,970	85,613	265
Q		6,960	56,782	6,072	2,607	72,421	321
D		896	25,907	791	794	28,388	334
V	3,082	1,709	28,324	1,368	505	35,757	526
N	2,635	1,155	45,018	81	1,471	51,153	378
U	1,207	1,295	26,814	906	588	31,643	687
F	2,144		36,139		350	39,577	791
O		16,672	98,258	4,481	1,096	120,507	941
P	1,913	280	24,748	1,046	1,205	30,081	293
W		2,663	18,095		363	21,265	343
S	586	2,861	32,164	1,710		38,551	612
A		3,260	81,359	945	258	85,822	429
T	2,883	100	20,102		501	25,151	433
B	4,292		18,504			24,227	282

education costs. The rationale for this is that much of the curriculum in home economics had multi-use and is relevant to the general education student, the student who is a transfer student, and the student who is preparing for an occupation. Often, a class will be composed of students who indicate their objectives are those noted above. Therefore, the administrator, rather than prorate expenditures, elects not to declare any of the program cost to vocational education.

Table 12

Health Program Expenditure Summary

Institution	Cost of Adm.	Cost of Super	Instructor Salary	Class Salary	Inst. Supply	Program Total	Per ADA Costs
K	$1,884	$16,764	$170,995	$ 8,086	$ 1,814	$207,694	$ 501
X	665	12,948	104,167	6,442	1,760	132,470	1,260
Q		12,977	99,796	8,560	1,232	122,565	770
D		12,480	204,576	5,252	5,448	227,756	498
V	6,163	3,152	156,516	5,700	13,257	186,326	1,140
N	3,324	12,815	160,375	8,622	6,336	192,500	929
C	3,302	15,761	64,469	7,515	5,575	98,457	1,254
U	4,115	17,065	150,878	7,875	4,390	187,161	1,199
F	6,723	22,306	126,436	11,743	3,381	173,564	1,113
P	20,347	300	131,707	6,061	8,397	174,593	1,213
W	682	21,778	115,061	6,552	4,107	148,360	915
S	1,952	9,091	128,110	1,753	2,053	143,622	812
A		30,559	150,352	15,607	15,800	212,318	1,303
T	2,883	975	43,284		3,179	51,886	850
E	3,680	5,700	31,004	3,716	1,806	57,491	700

Of the colleges included in this study, six provided data for home economics sufficiently clear to be included in the study. The range of expenditure per average daily attendance was from a low of $252 to a high of $923. The mean for all colleges was $493. Table 13 shows the expenditure categories and per average daily attendance costs for each college included in the study.

Table 13

Economics Program Expenditure Summary

Institution	Cost of Adm.	Cost of Super.	Instructor Salary	Class Salary	Inst. Supply	Program Total	Per ADA Costs
[illegible]	[illegible]45	[illegible]15	$26,939	$ 901	$1,705	$36,565	$ 252
[illegible]			66,219	24,130	81	90,430	513
V		975	12,769	782	234	14,760	923
C	825		13,589	861	589	16,325	466
[illegible]		107	2,388		243	2,810	
S	585		16,161	639	285	17,899	325
T	1,120		5,526			7,128	481

Office Education

Of the nineteen colleges included in the study, all conducted programs in office education. The expenditures for office education programs at one of the institutions was eliminated from the study. The rationale for elimination of data from this school will be explained in this chapter under the subheading Institutional Characteristics. Of the remaining colleges, the mean expenditure for instruction per average daily attendance unit was $622, with a range from a low of $420 to a high of $827.

A summary of institutional expenditures for office education is presented in Table 14.

Technical Education

A summary of technical expenditures is listed in Table 15. The [illegible] attendance expenditure was $665. Some fourteen

Table 14

Office Program Expenditure Summary

Institution	Cost of Adm.	Cost of Super.	Instructor Salary	Class Salary	Inst. Supply	Program Total	Per ADA Costs
K	$1,884	$11,907	$374,188	$12,844	$22,559	$627,573	$ 590
X	1,330	11,080	110,199	15,497	44,475	262,792	597
Q		6,960	94,588	600	2,893	105,041	607
D		1,582	266,575	8,923	29,129	306,209	472
V	3,082	3,748	149,676	4,542	78,338	240,155	703
N	4,352	2,696	89,696	1,948	48,372	148,001	611
C	3,686		19,130	3,794	49,993	178,652	742
U	4,480	4,786	131,409	3,354	10,311	157,429	827
O		17,794	65,094	26,874	76,830	186,592	723
P	969	375	87,864	11,537	45,008	146,148	808
W		5,112	148,005	1,581	53,100	208,732	636
S	1,366	6,708	130,317	10,577	3,195	162,698	533
A		2,170	42,450	628	1,264	46,512	456
T	2,883	400	85,093	40	19,401	109,382	420
G			84,262		24,141	109,403	655
B	6,311		66,105		2,780	77,423	553
E		879	32,192		2,660	35,731	649

colleges provided adequate data for inclusion in the study. The range of expenditures was from a low of $397 to a high of $911.

Table 15

Technical Program Expenditure Summary

Institution	Cost of Adm.	Cost of Super.	Instructor Salary	Class Salary	Inst. Supply	Program Total	Per ADA Costs
K	$1,884	$12,369	$237,583	$ 8,898	$11,403	$273,288	$ 539
X	1,330	11,080	110,199	8,314	9,284	140,776	920
Q		9,359	143,983	18,600	11,053	182,995	460
V	9,245	3,467	68,296		2,760	88,450	911
N	6,648	9,831	151,625	11,944	4,524	184,673	683
C	4,784	14,991	88,131	15,351	13,569	139,485	577
U	2,286		66,285	4,895	4,929	79,972	919
F	889		11,221	1,076	1,616	15,195	723
O		7,628	77,793	7,431	26,302	119,234	397
P	5,813		39,498	536	11,086	59,304	638
W		730	12,487		390	13,751	723
S	1,366	150	67,993	2,392	24,746	97,182	626
A		5,650	67,672	6,815	4,032	84,169	487
T	2,883	350	50,021	2,044	18,690	75,553	706

Trades and Industry Education

All of the nineteen colleges studied conducted programs in trades and industry education. The mean expenditure for each unit of average daily attendance was $585. The range was from a low of $307 to a high of $950. Table 16 presents a summary of expenditures by institution.

Table 16

Trades and Industry Program Expenditure Summary

Institution	Cost of Adm.	Cost of Super.	Instructor Salary	Class Salary	Inst. Supply	Program Total	Per ADA Costs
K	$1,884	$25,838	$334,524	$32,116	$51,215	$446,728	$ 398
X	665	19,419	224,932	10,649	15,336	271,286	356
Q		8,125	302,039	35,418	28,195	373,777	624
D		9,365	369,410	6,884	35,818	421,477	445
V	7,705	3,777	109,723	19,290	11,697	153,917	721
N	16,271	55,489	320,559	30,780	26,218	453,988	542
C	3,698		34,103	1,874	11,150	52,862	581
U	5,560	2,886	105,978	9,269	5,147	133,668	633
F	4,985	5,584	86,283	512	10,730	110,300	950
O		13,873	102,300	4,345	7,203	127,731	370
P	7,751	4,955	100,628	6,973	50,904	174,373	814
W		5,111	112,342	1,764	16,202	136,578	369
S	4,684	6,740	172,190	23,579	14,492	223,518	809
A		2,880	29,922	1,000	1,758	35,560	488
T	2,882	600	115,954	6,700	29,257	157,456	541
G			63,857	1,250	14,463	79,570	514
B	6,324		30,917		160	39,543	307
I	7,520	4,458	79,175	14,389	17,840	126,619	851
E		910	36,416		2,695	40,021	800

COMPARISON OF NON-VOCATIONAL COSTS TO VOCATIONAL PROGRAM COSTS

The expenditures for non-vocational educational programs were determined by utilizing the same expenditure categories as were used to identify vocational education program costs, with the exception that administrative costs were not included. These expenditure categories were: 212, supervisors' salaries; 213, teachers' salaries; 214, other certificated salaries; 220, classified salaries; 230, textbooks; and 290, other expenses of instruction. Since the analysis of data in this study was designed to compare costs per unit of average daily attendance, it was necessary to differentiate between average daily attendance generated by vocational education students and the average daily attendance generated by non-vocational students. To accomplish this, the total average daily attendance generated by vocational education programs was subtracted from the institutional total. The remainder was the average daily attendance generated by non-vocational programs. A summary of the total average daily attendance, the average daily attendance generated by vocational programs, and the percentage of the total generated by vocational education programs at each college is presented in Table 17. The amount of average daily attendance generated by vocational education programs ranged from a low of 8.2 percent at one college to a high of 27.3 percent at another institution. The mean percent of average daily attendance generated by vocational education programs for all the institutions was 20.5 percent.

Table 18 lists the per unit of average daily attendance costs for each college by vocational program, as well as the per unit of average daily attendance costs for non-vocational education programs.

Table 17

Summary of Average Daily Attendance Generated by Each College

Institution	Total Annual ADA Generated	Annual ADA Generated by Vo. Ed.	Percentage Vo. Ed. of Total
K	13,435	3,671	27.3
X	8,586	2,080	24.2
Q	8,276	1,553	18.7
D	8,586	1,895	22.0
V	7,063	786	11.1
N	6,448	1,691	26.2
C	5,681	709	12.4
U	5,616	694	12.3
F	4,988	592	11.8
O	4,857	926	19.0
P	4,714	738	15.6
W	4,349	955	21.9
S	3,965	1,178	29.7
A	3,647	691	18.9
T	2,800	854	30.5
G	2,723	697	25.5
B	1,856	385	20.7
I	1,063	289	27.1
E	751	190	25.2
		Percent of Total	20.5

Table 18

Actual Program Costs Per Unit of Average Daily Attendance by College

Institution	Non-Voc.	Agric.	Dist.	Health	H. E.	Office	Tech.	T & I
K	$540	$1,035	$426	$ 501	$	$590	$ 539	$ 398
X	600	793	265	1,260	252	597	920	356
Q	464		321	770		607	460	624
D	614	650	334	498	513	472		445
V	534		526	1,140	923	703	911	721
N	613		378	929		611	683	542
C	632			1,254	466	742	577	581
U	464	670	687	1,199		827	919	633
F	606		791	1,113		723	723	950
O	533		941				397	370
P	589		293	1,213		808	638	814
W	526		343	915		636	723	369
S	500	664	612	812	325	533	626	809
A	558		429	1,303		456	487	488
T	570	948	433	850		420	706	541
G	486	592				655		514
B	568		282			553		307
I	683				481			851
E	735	1,217	___	700	___	649	___	800
Mean	$569	$ 821	$470	$ 964	$493	$622	$665	$585

The mean cost per unit of average daily attendance for both the non-vocational and all the vocational programs in the sample was derived by totaling the expenditure in each category for the total sample and dividing it by the total average daily attendance generated. The mean cost for all non-vocational programs was $569 per unit of average daily attendance while the mean costs for all vocational programs was $636 per unit of average daily attendance. Of the seven vocational program areas, distributive and home economics had a mean per average daily attendance cost less than the mean for the non-vocational programs. The standard deviation for the non-vocational per average daily attendance was $84. The non-vocational per average daily attendance cost for fifteen of the institutions fell within one standard deviation of the mean, or 79 percent.

COST PREDICTORS

As stated previously in Chapter 1, actual vocational education program costs would be used to develop a program cost factor for each vocational program area. The factor could then be used to predict instructional costs for vocational education programs. In developing a formula for establishing program cost factors, it was necessary to identify cost variables which contribute to the excess cost of vocational education programs. One variable readily identifiable is the cost for instructors. It has been postulated that the cost of vocational education is greater because the number of students served by each vocational instructor is less than the number of students served by non-vocational education instructors. At the community college level, this variable is expressed as the weekly student contact hour generated by an instructor.

This is computed by multiplying the number of hours per week the instructor meets students by the number of students. Each institution included in this study provided the mean weekly contact hours for a full-time instructor in each of the vocational program areas as well as non-vocational areas. Table 19 is a summary, by vocational program, of the mean instructor weekly student contact hours for each institution studied. The mean weekly student contact hours for non-vocational instruction was 508 and the standard deviation was 74.29. The range was from a low of 360 to a high of 635. Some 79 percent of the institutions' non-vocational weekly student contact hours fell within one standard deviation of the mean.

Utilizing Formula I, as described in Chapter 1, a program cost factor ($\overline{P}$) was generated for each vocational program area. The vocational program areas and the respective $\overline{P}$ factor for each were:

Program Area	$\overline{P}$ Factor
Agriculture	1.073
Distributive	.723
Health	1.240
Home Economics	.620
Office	1.052
Technical	1.038
Trades and Industry	.984

Formula I was again used to predict the cost per unit of average daily attendance for each vocational program area at each institution. Mean data was applied to Formula I, except for one variable--the weekly

Table 19

Summary of Average Instructor Weekly Student Contact by Program Area

Institution	Non-Voc.	Agric.	Dist.	Health	H. E.	Office	Tech.	T & I
K	635	290	453	467		549	496	532
X	500	400	350	550	300	425	400	550
Q	600		484	330		600	450	457
D	504	345	428	411	345	451		433
V	523		498	316	256	505	472	455
N	495		375	278		582	317	632
C	512			257	417	508	355	356
U	574	381	497	385		497	466	430
F	496		300	288		502	475	350
O	450		480				588	620
P	445		560	315		380	356	500
W	500		450	395		515	495	500
S	530	485	370	460	480	454	566	500
A	540		510	300		500	475	500
T	569	384	473	418		518	414	543
G	513	437				463		473
B	520		427			479		478
I	387				387			408
E	360	304	___	411	___	385	___	520
Mean	508	378	444	372	364	489	452	486

student contact hour for the particular program at each college. The formula was as follows:

$$Cv = \bar{Co} \times \frac{\bar{No}}{Nv} \times \bar{P}$$

or

$$Cv = \begin{array}{c}\text{Mean cost of} \\ \text{Non-Vocational} \\ \text{Instruction}\end{array} \times \frac{\begin{array}{c}\text{Mean} \\ \text{Non-Vocational} \\ \text{WSCH}\end{array}}{\begin{array}{c}\text{WSCH of} \\ \text{College Vo-Ed} \\ \text{Program}\end{array}} \times \begin{array}{c}\text{Mean P Factor} \\ \text{for} \\ \text{Each Vocational} \\ \text{Program}\end{array}$$

The second formula, Formula II, which generated an add-on program cost factor, was applied to the same data from each vocational program at each college. This factor was identified as a $\bar{K}$ factor. The mean K factor for each vocational program area was as follows:

Program Area	$\bar{K}$ Factor
Agriculture	.098
Distributive	- .318
Health	.329
Home Economics	- .529
Office	.055
Technical	.045
Trades and Industry	.017

Vocational program cost predictions were computed for each institution by using the $\bar{K}$ factor in Formula II. Thus, the computation was:

$$Cv = \bar{Co} \times \frac{\bar{No}}{Nv} + \bar{Co}\bar{K}$$

or

$$Cv = \text{Mean cost of Non-Vocational Instruction} \times \frac{\text{Mean Non-Vocational WSCH}}{\text{WSCH of College Vo-Ed Program}} + \text{Mean Cost for Non-Vocational Instruction} \times \text{Mean Vocational Program K Factor}$$

The actual vocational program costs and the predicted costs generated by both formulas are presented by program in the succeeding tables. Table 20 shows actual and predicted costs for agriculture programs.

As noted in Chapter 1, the method of least squares was used to determine the usefulness of each prediction formula for each vocational program area. This test determines the amount of variance among actual program costs "explained" by the prediction formulas. The computation is as follows:

$$1 - \frac{\text{Sum of the squares of the difference between the actual and the predicted cost}}{\text{Sum of the squares of the difference between the actual and the actual mean cost}} = \text{Percent of variance "explained"}$$

For programs in agriculture, the test produced the following results:

Agriculture	Formula I	Formula II
The sum of the squares of the difference between the predicted and the actual costs	158,295	160,300
The sum of the squares of the difference between the actual and the corresponding mean	348,657	348,657
Percent of the variance "explained" by the prediction formula	55%	54%

For programs in agriculture, Formula I "explained" only slightly better than Formula II.

Table 20

Actual and Predicted Agriculture Program Cost
(N = 8)

Institution	Actual Cost	Formula I Predicted	Formula II Predicted
K	$ 1,035	$ 1,069	$ 1,053
X	793	775	778
D	650	898	894
U	670	813	815
S	664	639	652
T	948	808	809
G	592	710	717
E	1,217	1,020	1,007
Mean	$ 821	$ 842	$ 841

Table 21 shows actual and predicted costs for distributive programs. As demonstrated below, neither Formula I or Formula II "explained" any variance found among the actual program costs.

Distributive	Formula I	Formula II
The sum of the squares of the difference between the predicted and the actual costs	592,418	643,795
The sum of the squares of the difference between the actual and the corresponding mean	574,245	574,245
Percent of the variance "explained" by the prediction formula	0%	0%

Table 21

Actual and Predicted Program Cost for Distributive Programs
(N = 15)

Institution	Actual Cost	Formula I Predicted	Formula II Predicted
K	$ 426	$ 461	$ 457
X	265	597	645
Q	321	432	416
D	334	488	494
V	526	426	399
N	378	557	590
U	687	420	400
F	791	696	782
O	941	435	421
P	293	373	335
W	343	464	361
S	612	565	600
A	429	410	386
T	433	442	430
B	282	489	496
Mean	$ 470	$ 484	$ 484

Formula I and II produced predicted costs for health programs, which are shown in Table 22. The amount of variance "explained" by Formula I and II is shown below.

Table 22

Actual and Predicted Costs for Health Programs
(N = 16)

Institution	Actual Cost	Formula I Predicted	Formula II Predicted
K	$ 501	$ 768	$ 806
X	1,260	651	712
Q	770	1,086	1,063
D	498	872	890
V	1,140	1,133	1,101
N	929	1,288	1,226
C	1,254	1,394	1,311
U	1,199	931	938
F	1,113	1,244	1,190
P	1,213	1,137	1,104
W	915	908	919
S	812	779	815
A	1,303	1,194	1,150
T	850	857	878
E	7 700	872	890
Mean	$ 964	$ 1,008	$ 937

Health	Formula I	Formula II
The sum of the squares of the difference between the predicted and the actual costs	842,163	866,230
The sum of the squares of the difference between the actual and the corresponding mean	1,034,720	1,034,720

Percent of the variance "explained" by the prediction formula	18.6%	16.3%

The difference in the amount of variance "explained" by Formula I and II for health programs was 2.3%. Formula I is the better of the two formulas as it "explained" a greater percent of the variance.

Actual and predicted program costs for home economics are shown in Table 23.

Table 23

Actual and Predicted Cost for Home Economics Programs
(N = 6)

Institution	Actual Cost	Formula I Predicted	Formula II Predicted
X	$ 252	$ 597	$ 662
D	513	519	537
V	923	700	828
C	466	430	392
S	325	373	301
I	481	463	446
Mean	$ 493	$ 514	$ 528

The amount of variance "explained" by Formula I and II in home economics programs is shown below.

Home Economics	Formula I	Formula II
The sum of the squares of the difference between the predicted and the actual costs	172,714	184,978

The sum of the squares of the difference between the actual and the corresponding mean	272,478	272,478
Percent of the variance "explained" by the prediction formula	36.6%	32.2%

The small N of 6 prohibits generalizations to be made relative to home economics programs. However, in this sample, Formula I was the better predictor since it "explained" a larger percent of the variance.

Table 24 shows the actual and predicted costs found for office programs. Neither Formula I nor Formula II were able to "explain" any of the variance found among the actual program costs for office education. The results of the least squares test is shown below.

Office	Formula I	Formula II
The sum of the squares of the difference between the predicted and the actual costs	263,130	281,176
The sum of the squares of the difference between the actual cost and the corresponding mean	215,334	215,334
Percent of the variance "explained" by the prediction formula	0%	0%

Actual and predicted costs for technical programs are shown in Table 25. Neither prediction Formula I nor II was able to "explain" any of the variance among the actual program costs. The application of the least squares test on technical programs' costs follows.

Table 24

Actual and Predicted Cost for Office Programs
(N = 18)

Institution	Actual Cost	Formula I Predicted	Formula II Predicted
K	$ 590	$ 553	$ 557
X	597	715	411
Q	607	507	512
D	472	674	671
V	703	602	603
N	611	522	527
C	742	599	600
U	827	612	559
F	723	606	607
P	808	800	792
W	636	590	592
S	533	670	668
A	456	608	609
T	420	587	589
G	655	656	655
B	553	635	634
E	649	790	782
Mean	$ 622	$ 596	$ 593

Table 25

Actual and Predicted Cost for Technical Programs
(N = 14)

Institution	Actual Cost	Formula I Predicted	Formula II Predicted
K	$ 539	$ 606	$ 609
X	920	751	749
Q	460	668	668
V	911	637	638
N	683	948	938
C	577	847	840
U	919	645	646
F	723	633	634
O	397	511	518
P	638	844	838
W	723	607	610
S	626	511	537
A	487	633	634
T	706	726	724
Mean	$ 665	$ 683	$ 684

Technical	Formula I	Formula II
The sum of the squares of the difference between the predicted and the actual costs	481,520	465,842
The sum of the squares of the difference between the actual cost and the corresponding mean	370,193	370,193

Percent of the variance "explained" by the prediction formula	0%	0%

Table 26 shows actual and predicted program costs for trades and industry. The least squares test applied to cost data generated by trades and industry programs produced the following results.

Trades and Industry	Formula I	Formula II
The sum of the squares of the difference between the predicted and the actual costs	525,304	531,776
The sum of the squares of the difference between the actual and the corresponding mean cost	670,570	670,570
Percent of the variance "explained" by the prediction formula	21.7%	70.7%

Both Formula I and II were able to "explain" approximately twenty percent of the variance found among actual costs for programs in trades and industry.

INSTITUTIONAL CHARACTERISTICS

Several approaches were used in an attempt to identify institutional characteristics that might contribute either to a high or to a low cost per average daily attendance for each vocational program. The research for this component took several forms, including visits to eight colleges, as well as telephone conversations with the directors of vocational education at all institutions included in this study. Initially, consideration was given to the size of the institution, the geographic location, and the nature of the community served. As the study developed,

Table 26

Actual and Predicted Cost for Trades and Industry Programs
(N = 19)

Institution	Actual Cost	Formula I Predicted	Formula II Predicted
K	$ 398	$ 535	$ 532
X	356	5178	516
Q	624	622	622
D	445	657	657
V	721	625	625
N	542	450	417
C	581	799	802
U	633	661	662
F	950	812	816
O	370	459	456
P	814	569	568
W	369	569	568
S	809	569	568
A	488	569	568
T	541	524	522
G	514	601	601
B	307	595	595
I	851	697	698
E	800	547	546
Mean	$ 585	$ 599	$ 597

it was necessary to consider the kinds of occupations for which students were being prepared in each of the seven broad vocational program areas. A second consideration was a question about the reliability of the data submitted to the Office of the Chancellor, California Community Colleges, describing the program costs and the average daily attendance generated by each program. Data on certain programs from several colleges proved unreliable. The data from the affected institutions was excluded after consultation with the directors of vocational education.

Two tables were developed to aid in the study of institutional characteristics which might affect the cost of vocational programs. Table 27 is a matrix of general information which ranks each college by order in the areas of district wealth, expressed as assessed valuation per average daily attendance; the size of the college by total average daily attendance and by average daily attendance generated by vocational programs; expenditure per average daily attendance for both non-vocational and vocational programs; the nature of the community served; and the geographic location of each institution (the city of Fresno was selected as the mid-point between north and south).

Some general observations can be drawn from this matrix. For example, it appears that the wealth of the district does not affect the amount spent to support vocational programs. While college I is the wealthiest college and ranks fourth in per average daily expenditure for vocational programs, college B, the second most wealthy, ranks last in expenditure per average daily attendance for vocational programs. The poorest district stands sixth in expenditures per vocational average daily attendance.

Table 27

Rank Order of Institutional Characteristics

Institution	Rank Order by Assessed Evaluation per Apportionment ADA	Rank Order by Total ADA	Rank Order by Vo-Ed ADA	Rank Order by Expenditure per Non-Vo-Ed ADA	Rank Order by Expenditure per Vo-Ed ADA	Nature of Community Served	Geographic Location
K	13	1	1	11	18	Industrial	S
X	5	2	2	7	17	Rural Industrial	S
Q	3	3	5	18	16	Industrial	S
D	9	4	3	4	10	Rural	N
V	7	5	10	12	1	Suburban	N
N	4	6	4	5	11	Industrial	N
C	18	7	12	3	7	Suburban	S
U	11	8	14	19	2	Rural	N
F	8	9	16	6	3	Suburban	N
O	6	10	8	13	12	Industrial	S
P	12	11	11	8	5	Suburban	N
W	16	12	7	14	15	Suburban	S
S	14	13	6	16	9	Rural	N
A	15	14	15	10	8	Suburban	N
T	10	15	9	9	14	Rural	N
G	17	16	13	17	13	Rural	N
B	2	17	17	15	19	Suburban	N
I	1	18	18	2	4	Rural	S
E	19	19	19	1	6	Rural	N

Those colleges with the largest vocational education enrollments are able to provide vocational programs less expensively than those with the smallest vocational enrollments, which tend to expend more per average daily attendance for both non-vocational and vocational students. The California Legislature has recognized this problem by providing a separate and increased foundation support program for community colleges with an average daily attendance of 1,000 or less. (15) Neither the nature of the community served nor the geographic location of the institution in California appear to affect the amount expended for vocational programs.

The second matrix developed, Table 28, permits the comparison of the rank order per average daily attendance expenditure and the rank order of average daily attendance generated by each vocational program at each college. A further explanation of each vocational program area and of institutional characteristics influencing program costs follows.

Agriculture Education

One would expect the cost per average daily attendance for agriculture programs to be greater than for non-vocational programs. In order for agriculture programs to qualify for support from Federal vocational funds, the program standards, as identified in the California State Plan for Vocational Education, must be met. Section 3.51 requires that the instructional program provide for twelve months of supervision. Thus, in approved agriculture programs, the instructor is typically issued a twelve-month contract, which increases the costs for instructor salaries by about ten percent over other programs. (18;58)

Table 28

Rank Order by Program Expenditure and ADA*

Institution	Agric.		Dist.		Health		H. E.		Office		Tech.		T & I	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
K	2	7	8	1	13	2			13	1	11	1	15	1
X	4	2	15	2	2	9	6	2	12	3	2	5	17	4
Q			12	3	11	6			11	12	13	2	8	5
D	7	5	11	9	14	1	2	1	18	2			14	2
V			5	10	6	4	1	5	3	6	1	12	6	10
N			9	5	8	3			10	9	7	6	10	3
C					3	11	4	4	5	10	10	7	9	17
U	5	8	4	14	5	7			2	13	3	11	7	12
F			2	13	7	7			6	8	5	13	1	16
O			1	6							14	3	19	7
P			13	7	4	8			4	11	8	10	3	11
W			10	11	9	5			9	4	4	14	16	6
S	6	4	3	11			5	3	15	5	9	8	4	9
A			7	4	1	8			16	16	12	4	13	18
T	3	6	6	12	10	12			17	7	6	9	11	8
G	8	1							7	14			12	13
B			14	8					14	15			18	15
I					12	10	3	6	1	18			2	14
E	1	3							8	17			5	19

* A represents the Rank Order per ADA Expenditure; B represents Rank Order ADA.

The college with the highest expenditure per average daily attendance in agriculture, college E, is a small rural college. Although considered a small college, E ranks second in the study in the amount of average daily attendance generated by agriculture programs. The institution ranked second for expenditure per average daily attendance in agriculture (K) ranked only seventh in average daily attendance, while college G, with the largest agriculture enrollment, had the lowest expenditure per average daily attendance. This indicates that larger enrollments tend to reduce the per average daily attendance costs. Appendix D is a listing of each college and the occupational programs in agriculture offered by each institution.

Distributive Education

No unique institutional characteristics could be identified that contribute to the variation in the costs per average daily attendance in distributive education programs. Most of the colleges included in the study offered programs in real estate, which typically is taught by hourly instructors, reducing instructor hourly costs. See Appendix E for a listing of occupational programs under distributive education. The institutions with the largest enrollments, K, X and Q, tended to rank in the lower half for per average daily attendance expenditure.

Health Education

Health education programs are, generally, the most expensive vocational programs conducted by California community colleges. This can be attributed to two readily identifiable factors. These factors are the high cost of supervision and of instructor salaries. In California,

health program standards are established by the state licensure agency or board. Therefore, in order for a student to qualify for an opportunity to take the state examination, he must be a graduate of a training program accredited by the licensure board. Currently, most licensure boards establish maximum instructor-to-student ratios. For example, both Registered Nurse and Licensed Vocational Nurse programs have a maximum instructor-to-student ratio for clinical experiences. For the Registered Nurse programs, it is one-to-ten and for the Licensed Vocational Nurse it is one-to-fifteen. Also, each board requires that each program must have a director, which accounts for the higher supervision costs.

A review of Appendix F, which lists all health occupational preparation programs, indicates that those colleges with lower costs per average daily attendance for health programs have established programs outside the jurisdiction of any regulatory agency. By establishing programs such as Nurse's Aide and Home Health Aide, instructor-to-student ratios can be increased; thus total program cost per average daily attendance may be reduced. Colleges D and K, with the highest enrollments and lowest costs, have several such low-cost health education programs, while colleges A, X and C, with higher costs, have few such programs. Again, it appears that the programs with the larger average daily attendance are the least expensive.

Home Economics

No institutional characteristics could be identified which might contribute to the variation of per average daily attendance costs for home economics occupational preparation programs. One would have to study the structure of the program at each college to identify program

differences which are not institutional. Appendix G shows home economics occupational programs.

Office Education

Data relative to office education costs at one college was eliminated from this study because equipment lease costs were included in instructional supply costs and could not be separated. A review of Table 28 again indicates that those colleges with programs that generate a high amount of average daily attendance have a direct relationship to a lower cost per average daily attendance. Low program enrollments are more expensive to maintain. Appendix H, a listing of office occupational preparation programs, indicates that, while cost for the small school is higher than for the large school, the small college also avoids such expensive programs as data processing.

Technical Education

Two characteristics have been identified as factors that contribute to the variation of per average daily attendance costs among the various colleges. One is the amount of average daily attendance generated by the program and the second is the kind of programs identified as technical. Table 28 illustrates that colleges with the higher per average daily attendance tend to have lower costs, and, conversely, those with lower average daily attendance tend to have higher costs. Appendix I is a listing of all occupational programs under technical education. Those colleges with lower per average daily attendance costs tend to decrease their costs by classifying several programs, which do not require specialized facilities (thus influencing class size) as technical. For example, programs such as fire and police science, commercial

pilot, nursing school aide, and construction technology are generally lecture programs, while electronics, electro-mechanical, and aeronautics technology typically require laboratories which limit the number of students served.

Trades and Industry

Again, those schools with programs that generate the greater amount of average daily attendance tended to have lower costs. College B, which is an exception to the above statement, is unique in that it has both low enrollment and low cost. However, a review of Appendix J, a table of occupational programs which are considered trades and industry, shows that B has no specialized facilities except a drafting room; thus it offers only lecture programs. Institution I has high costs, but, again, this is a small college. No additional institutional characteristics could be identified that seemed to affect trades and industry program costs.

Chapter 4

SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND FINAL REMARKS

This study was conducted by analyzing the annual instructional expenditures of nineteen community colleges in California. The sample represented twenty percent of California community colleges. Data were gathered on the total institutional instructional expenditure and the vocational instructional expenditure. Costs per average daily attendance for non-vocational students and for each of the seven vocational program areas were calculated for each college.

SUMMARY

The primary objectives of this study were to (1) identify vocational education programs that generate instructional cost in excess of the instructional cost of non-vocational programs, (2) test the feasibility of two formulas for predicting vocational education instructional cost by vocational program, (3) attempt to identify institutional characteristics that influence the cost of vocational education programs, and (4) determine if the costs of similar vocational programs conducted by different institutions were the same.

The major findings of this study were:

1. Of the nineteen California community colleges studies, the mean percent of instructional expenditure devoted to vocational education program support was 16.89.

2. The mean expenditure for instruction per unit of average daily attendance for each of the seven vocational program areas was:

Agriculture	$ 821
Distributive	470
Health	964
Home Economics	493
Office	622
Technical	665
Trades and Industry	585

3. Some 20.5 percent of the total average daily attendance reported by the nineteen colleges in the study was generated by vocational programs.

4. The mean expenditure per unit of average daily attendance for non-vocational instruction was $569. This was less than the mean for agriculture, health, office, technical and trades and industry programs, and greater than the mean for distributive and home economics programs.

5. The mean weekly student contact hours generated per full time instructor was:

Agriculture	378
Distributive	444
Health	372
Home Economics	364
Non-Vocational	508
Office	489
Technical	452
Trades and Industry	486

6. Of the two prediction formulas, Formula I, $Cv = \bar{Co} \times \frac{\bar{No}}{Nv} \times \bar{P}$ was the better prediction formula.

7. Neither of the prediction formulas were able to "explain" enough of the variance among the actual vocational program costs that either formula could be used as a model for the allocation of funds.

	Percent of Variance "Explained"	
Program	Formula I	Formula II
Agriculture	55.0%	54.0%
Distributive	0.0%	0.0%
Health	18.6%	16.3%
Home Economics	36.6%	32.2%
Office	0.0%	0.0%
Technical	0.0%	0.0%
Trades and Industry	21.7%	20.7%

8. Colleges with large enrollments in vocational programs tend to have lower cost per student.

9. The wealth of a district, the community it serves, and the geographic location of the institution appear to have no effect on the expenditure rates per student in vocational programs.

CONCLUSIONS

The following conclusions can be drawn from this study. Those questions asked earlier in "The Purpose of the Study" can be answered as follows:

1. Not all vocational education programs generate an excess in instructional costs when compared to non-vocational programs in California community colleges. The mean difference between expenditures per

unit of average daily attendance in vocational programs and in other programs were:

Program	Mean Vocational Program Expenditure	Mean Non-Vocational Program Expenditure	Difference
Agriculture	$ 821	$ 569	+ $ 252
Distributive	470	569	- 99
Health	964	569	+ 395
Home Economics	493	569	- 76
Office	622	569	+ 53
Technical	665	569	+ 96
Trades and Industry	585	569	+ 16

Thus, of the seven vocational education program areas, agriculture, health, office, technical and trades and industry required an expenditure for instruction that was greater than the expenditure for the non-vocational programs. Programs in distributive education and home economics required an expenditure less than that expended on instruction for the non-vocational programs.

2. It would appear that there are variables other than those used in the prediction formulas that should be considered when developing a formula for predicting vocational program cost.

3. The size of the enrollment within a vocational program appears to have an influence on the per student cost.

4. There is a wide range of expenditure per student for similar vocational programs conducted by different colleges. The vocational program areas and the range of expenditure for each program area were:

Program	High	Low	Range
Agriculture	$ 1,217	$ 592	$ 625
Distributive	941	265	676
Health	1,303	498	805
Home Economics	923	243	680
Office	927	397	530
Technical	920	397	523
Trades and Industry	950	307	643

RECOMMENDATIONS

The data gathered in this investigation have implications for several interested groups. It is recommended that community college districts in California, the Office of the Chancellor of the California Community Colleges, and vocational education researchers utilize the results of this study in the following manner:

1. Community college districts should:
   a. Establish minimum program enrollments to assure maximum utilization of fiscal resources.
   b. Establish accounting procedures which permit the ready identification of expenditures by vocational program area.
2. The Office of the Chancellor, California Community Colleges, should:
   a. Utilize a method for the distribution of federal vocational education funds to local college districts that give consideration to the number of students enrolled and the kinds of vocational programs conducted by the various community colleges in California.

b. Provide an annual vocational education expenditure summary and analysis by vocational program area to local community college districts. The summary should establish data relative to mean vocational program costs. These data could then be utilized by local districts in long-range and area planning.

c. Develop a uniform system of program accounting which identifies direct instructional program costs.

3. Vocational education researchers should:

a. Undertake an in-depth study of the financing of home economics programs conducted by California community colleges. The study should establish some method for proration of instructional costs to the objectives of the students being served. This would permit the correct amount of fiscal expenditures for vocational education programs and students to be identified.

b. Conduct a study of the capital outlay expenditures needed to establish and maintain instructional programs in each of the seven vocational program areas. This study was limited to current instructional costs and did not consider capital expenditures in the data analysis.

c. Develop a set of formulas for predicting cost of vocational education programs in California community colleges that give consideration to the size of the vocational program enrollment and the size of the institution.

BIBLIOGRAPHY

SELECTED BIBLIOGRAPHY

BOOKS AND PAPERS

1. Anderson, Ernest F. Differential Costs of Curricula in Comprehensive Junior Colleges, Urbana, Illinois. U. S. Department of Health, Education and Welfare, Office of Education, 1966.

2. Arnold, Walter M. "50 Years of Federal-State Partnerships," American Vocational Journal, XL (March, 1967)

3. Bagley, William C. Determinism in Education. New York: Warwick and York, 1925.

4. Barlow, Melvin L. History of Industrial Education in the United States. Peoria, Illinois: Chas. A. Bennet Co., Inc., 1967.

5. Burkhead, Jesse. Government Budgeting. New York: John Wiley, 1965.

6. Cage, B. N. and Richard P. Manatt. "Cost Analysis of Selected Educational Programs in the Community Colleges of Iowa," Journal of Educational Research, LXIII (October, 1969), 66-67.

7. California Teacher's Association. Financing California Public Schools. Los Angeles: Research Office, California Teacher's Association, 1967, pp. 57-59.

8. California Teacher's Association. "Selected Financial Data--High School Districts and Junior College Districts, 1966-67," Research Bulletin No. 215. Burlingame: California Teacher's

9. Center for Studies in Vocational and Technical Education. Research in Vocational and Technical Education--Proceedings of a Conference. Madison: Center for Studies in Vocational and Technical Education, the University of Wisconsin, 1967.

10. Doi, James I. and John Dale Russell. "Finance--Colleges and Universities," Encyclopedia of Educational Research. New York: Macmillan, 1960, p. 544.

11. Kaufman, Jacob J. An Analysis of the Comparative Costs and Benefits of Vocational Versus Academic Education in Secondary Schools. (Grant No. 1-6-000512-0817) University Park, Pennsylvania: The Pennsylvania State University, 1967.

12. Kilzer, L. R. "How Local Public Junior Colleges are Financed," School Record, XLIV (January, 1937), 686.

13. McLure, William P. "Rationale for Organizing, Administering, and Financing Vocational Education," Melvin L. Barlow (ed.), Vocational Education. 64th Yearbook of NSSE. Chicago: The University of Chicago Press, 1965.

14. NEA Committee on Educational Finance. The Challenge of Change in School Finance. Washington, D.C.: National Education Association, 1967.

15. Siegel, Sidney. Non-Parametric Statistics. New York: McGraw-Hill Book Co., 1956.

16. Walker, Helen M. and Joseph Lev. Elementary Statistical Methods. Revised ed. New York: Henry Holt and Company, 1958.

STATE AND FEDERAL PUBLICATIONS

17. California State Department of Education. California School Accounting Manual. Sacramento: California State Department of Education, 1968.

18. California State Plan for Vocational Education, Part I. Administrative Provisions. Sacramento: California State Department of Education, 1970.

19. Coordinating Council for Higher Education. California Public Higher Education Cost and Statistical Analysis. Sacramento: California State Department of Education, 1965, Table 3A-2s, pp. 1-4.

20. Education Code. Sacramento: California State Printing Office, 1967.

21. Education for a Changing World of Work, A report of the Panel of Consultants on Vocational Education, United States Department of Health, Education and Welfare. Washington, D.C.: Government Printing Office, 1963.

22. Financing California's Public Junior Colleges, Coordinating Council for Higher Education, Part I. Sacramento: California State Department of Education, November, 1966; Part II, January, 1967.

23. Hawkins, Layton S. and others. "Development of Vocational Education," Development of Federal Legislation for Vocational Education, U. S. Department of Health, Education and Welfare. Chicago: American Technical Society, 1962.

24. Heinkel, Otto A. and Dean G. Klampe. A Cost Accounting Model to Assess Actual Costs of Vocational and Non-vocational Courses. (Project No. 37-765-AB-21-70) Sacramento: Office of the Chancellor, California Community Colleges, 1970.

25. Lindman, Erick L. Financing Vocational Education in the Public Schools. (National Educational Finance Project Special Study No. 4) Los Angeles: Graduate School of Education, University of California at Los Angeles, 1970.

26. McLure, William P., George C. Mann, Herbert M. Hamlin, M. Ray Karnes, and P. Van Miller. Vocational and Technical Education in Illinois. Urbana, Illinois: Bureau of Educational Research, University of Illinois, 1960.

27. Public Law 90-576. 90th Congress, Vocational Education Amendments of 1968. Approved October, 1968.

28. Public Law 88-210. 88th Congress, Vocational Education Amendments of 1963. Approved December 18, 1963.

29. Public Law 87-344. 87th Congress, Extension of National Defense Education Act. Approved October 3, 1961.

30. Public Law 87-22. 87th Congress, Extension of Health Amendments. Approved April 24, 1961.

31. Public Law 85-864. 85th Congress, National Defense Education Act. Approved September 2, 1958.

32. Public Law 1072. 84th Congress, Fisheries Amendment Act. Approved August 8, 1956.

33. Public Law 911. 84th Congress, Health Amendments Act. Approved August 2, 1956.

34. Public Law 586. 79th Congress, George-Barden Act. Approved August 1, 1946.

35. Public Law 673. 74th Congress, George-Deen Act. Approved June 8, 1936.

36. Public Law 245. 73rd Congress, George-Ellzey Act. Approved May 21, 1934.

37. Public Law 702. 70th Congress, George-Reed Act. Approved February 5, 1929.

38. Public Law 347. 64th Congress, Smith-Hughes Act. Approved February 23, 1917.

39. Ross, John G., Edgar Morphet, and Chester J. Swanson. Analysis of Expenditures for Vocational-Technical Education Programs. (Contract No. OEG-4-6-000542-0001) Berkeley: University of California, 1967.

40. Technical Committee on Costs of Higher Education in California. The Costs of Higher Education in California, 1960-1975. Sacramento: State Department of Education, 1957.

41. Virginia Community College System. Full-Time Equivalent Operating Costs. Richmond: Virginia State Department of Education, 1968.

42. Vocational Education, the Bridge Between Man and His Work, General Report of the Advisory Council on Vocational Education. Washington, D.C.: U. S. Department of Health, Education and Welfare, 1968.

43. Yett, Frank A. Vocational Homemaking Education Program Costs in California Public Schools. A study prepared for the Bureau of Homemaking Education, California State Department of Education. Los Angeles: The University of California, 1957.

DOCTORAL DISSERTATIONS

44. Anderson, Ernest F. "Differential Costs of Curriculums in Comprehensive Junior Colleges." Unpublished Doctor's dissertation, University of Illinois, Urbana, 1966.

45. Downing, G. M. "Financing of Special Education in California." Unpublished Doctor's dissertation, Stanford University, Palo Alto, California, 1953.

46. Hamilton, J. J. "An Analysis of Budgeting Control Systems in High Schools in California." Unpublished Doctor's dissertation, University of Southern California, Los Angeles, 1963.

47. Hanson, Nels W. "Economy of Scale in Education." Unpublished Doctor's dissertation, Stanford University, Palo Alto, California, 1963.

48. Heath, James L. "An Analysis of the Costs of Selected Industrial Arts Programs in San Diego County." Unpublished Doctor's dissertation, University of California, Los Angeles, 1967.

49. Kenne, Thomas Wayne. "Foundation Program Cost Differentials for Community Colleges." Unpublished Doctor's dissertation, University of Florida, Tallahassee, 1963.

50. Knapp, W. D. "Resource Allocation in Education: An Analysis of Educational Input." Unpublished Doctor's dissertation, University of Wisconsin, Madison, 1965.

51. Parry, Ernest B. "An Investigation of Cost Differentials Between Trade and College Parallel Curriculums Offered in North Carolina's System of Comprehensive Community Colleges." Unpublished Doctor's dissertation, University of North Carolina, Chapel Hill, 1968.

52. Robertson, Lyle R. "A System for Determining Educational Program Costs: Application to Comprehensive Community Colleges." Unpublished Doctor's dissertation, Wayne State University, Detroit, Michigan, 1968.

APPENDIXES

APPENDIX A

INSTITUTIONAL DATA FORM*

A. College current cost of instruction _____A

B. College current cost of vocational education _____B

C. College current cost for instruction other than vocational education _____C

D. Annual Average Daily Attendance generated by students in the college _____D

E. Annual Average Daily Attendance generaged by college students in vocational education programs _____E

F. Annual Average Daily Attendance generated by students other than vocational students _____F

G. Annual costs per Average Daily Attendance for students other than vocational _____G

H. College average Weekly Student Contact hours for non-vocational instructors _____H

*Adapted from a paper, Memorandum Concerning the Excess Cost of Vocational Education, by Erick L. Lindman and Dan Aldrich. UCLA Project on Financing Vocational Education in Public Schools, page 16.

APPENDIX B

INSTITUTIONAL VOCATIONAL PROGRAM COST FORM

Institution_____ Program _____

A. Current cost of administration of vocational program _____A

B. Current cost of supervision of vocational program _____B

C. Current cost of vocational instructor's salaries _____C

D. Current cost of classified staff salaries _____D

E. Current cost of instructional supplies _____E

F. Total current cost of vocational education programs _____F

G. Annual Average Daily Attendance generated by students in the vocational program _____G

H. Annual current cost per Average Daily Attendance in the Vocational program _____H

I. Average Weekly Student Contact Hours per instructor in the vocational program _____I

APPENDIX C

WEEKLY STUDENT CONTACT HOUR DATA FORM, 1969-70

College_____ Date_____

1. College average Weekly Student Contact Hours for non-vocational instructors, 1969-70. _____

2. Average Weekly Student Contact Hours for instructors in Agriculture programs conducted in 1969-70. _____

3. Average Weekly Student Contact Hours for instructors in Distribution programs conducted in 1969-70. _____

4. Average Weekly Student Contact Hours for instructors in Health programs conducted in 1969-70. _____

5. Average Weekly Student Contact Hours for instructors in Home Economics programs conducted in 1969-70. _____

6. Average Weekly Student Contact Hours for instructors in Office programs conducted in 1969-70. _____

7. Average Weekly Student Contact Hours for instructors in Technical programs conducted in 1969-70. _____

8. Average Weekly Student Contact Hours for instructors in Trade and Industry programs conducted in 1969-70. _____

APPENDIX D

OCCUPATIONAL PROGRAMS IN AGRICULTURE

Program	Institution							
	K	X	D	U	S	T	G	E
Agri-Business		X	X		X		X	X
Agri-General						X	X	X
Agronomy	X							
Animal Science	X		X	X				
Crop Production	X	X				X		
Forestry			X				X	X
Gardening				X				
Ground Maintenance	X							
Horticulture Ornamental	X	X	X	X	X	X	X	X
Landscape Design				X				
Mechanic			X		X		X	
Nursury Business				X				
Plant Science	X		X					

APPENDIX E

OCCUPATIONAL PROGRAMS IN DISTRIBUTIVE

Program	Institution														
	O	F	S	U	V	T	A	K	N	W	D	Q	P	B	X
Advertising				X				X				X			
Airline Stewardess	X							X							
Air Transportation								X						X	
Finance and Credit													X		
Food Distribution								X							
Food Services								X							
Hotel-Motel								X							
Insurance	X			X	X			X					X	X	
Marketing									X						
Merchandising	X		X		X	X	X	X		X	X	X	X		
Purchasing								X							
Real Estate	X	X		X	X	X	X	X	X	X	X	X	X	X	
Recreation Aide					X			X		X				X	X
Retailing		X		X								X			
Teacher's Aide															X
Traffic Management					X										
Transportation			X					X	X						

APPENDIX F

OCCUPATIONAL PROGRAMS IN HEALTH

Program	Institution														
	Z	X	C	P	U	V	F	N	W	T	Q	I	K	D	S
Community Development														X	
Dental Assistant	X		X	X	X	X	X	X					X		
Dental Hygiene	X					X									
Dental Laboratory													X		
Home Health Aide				X			X			X					
Inhalation Therapy			X								X		X		
Laboratory Technician															X
Licensed Vocational Nursing	X	X		X	X		X		X	X	X	X	X	X	X
Medical Assistant				X	X	X							X	X	
Medical Secretary	X														
Mental Health Technician								X							
Nurses Aide				X	X		X		X			X			X
Nurse Clerk	X														
Occupational Therapy									X						
Pre-Nursing		X													
Psychiatric Technician		X											X	X	

APPENDIX F (Continued)

Program	Institution														
	Z	X	C	P	U	V	F	N	W	T	Q	I	K	D	S
Radiologic Technician	X			X							X		X	X	
Registered Nurse	X	X	X	X	X	X	X	X	X		X		X	X	X
Social Welfare Aire														X	
X-Ray Technician		X													

APPENDIX G

OCCUPATIONAL PROGRAMS IN HOME ECONOMICS

	Institution					
Program	V	D	I	C	S	X
Child Care		X			X	
Child Development				X		
Clothing and Textiles					X	
Family Living		X				
Food Preparation		X			X	
Home Economics						X
Home Furnishing		X			X	
Nursery School Assistant	X		X	X		

APPENDIX H

OCCUPATIONAL PROGRAMS IN OFFICE

Program	Institution									
	I	U	V	P	C	F	G	E	W	Q
Accounting		X	X	X	X	X	X	X	X	
Bookeeping		X								
Broadcasting										X
Business Administration										X
Clerical	X	X		X	X	X	X	X		
Communications					X					
Data Processing		X		X	X	X	X		X	X
General Business							X			
Instructional Media					X					
Journalism					X					
Library Technician				X	X		X	X		
Personnel Training				X						
Stenography and Secretarial	X	X	X	X	X	X	X	X	X	X
Supervision and Management				X		X	X	X	X	X
Teacher Assistant	X				X					
Typist		X		X	X					

APPENDIX H (Continued) OFFICE (Part 2)

Program	Institution								
	X	K	B	S	A	T	D	O	N
Accounting	X	X	X	X	X	X	X	X	X
Bookeeping							X		
Broadcasting							X		
Business Administration		X							
Clerical		X	X	X	X	X	X	X	X
Communications	X								
Data Processing	X		X	X	X	X	X	X	X
General Business									
Instructional Media									
Journalism									
Library Technician	X					X	X		
Personnel Training									
Stenography and Secretarial	X	X	X	X	X	X	X	X	
Supervision and Management			X	X		X	X		
Teacher Assistant				X					
Typist			X			X			

APPENDIX I

OCCUPATIONAL PROGRAMS IN TECHNICAL

Program	Institution														
	V	X	U	W	F	T	N	P	S	C	K	A	Q	O	G
Aeronautics Technician	X														
Architectural Technician										X	X				
Bio-Medical										X					
Civil Technology	X		X				X			X	X	X			
Chemical Technician											X				
Commercial Pilot				X				X			X				X
Construction Technician					X		X					X	X		
Electro-Mechanic	X												X		
Electronics	X		X		X	X		X	X	X	X				X
Engineering Technician		X					X	X	X	X	X				
Fire													X		
Forestry			X			X									
Industrial Technician														X	
Instrumentation										X					
Library Technician	X						X					X			
Machine and Tool Design											X				

APPENDIX I (Continued)

Program	Institution														
	V	X	U	W	F	T	N	P	S	C	K	A	Q	O	G
Manufacturing Technician											X				
Marine Diving								X							
Materials and Processes										X					
Mechanical Servicing												X			
Mechanicial Technician									X		X		X	X	
Nursery School Aide							X								
Oceanographic Technician											X	X			
Petroleum Technician											X				
Police Science							X						X		X
Production Control											X				
Radiation Technician	X														
Sanitation														X	
Scientific Data Processing														X	
Surveyor Technician											X	X		X	
Tool Design											X				

APPENDIX J

OCCUPATIONAL PROGRAMS IN TRADES AND INDUSTRY

Program	Institution									
	F	I	P	S	B	V	U	Q	A	C
Air Conditioning			X					X		
Aircraft Maintenance				X						
Aircraft Operations				X						
Air Traffic Controller										
Auto Mechanic	X	X	X	X		X	X	X		
Auto Body and Fender	X	X								
Auto Service			X							
Barbering	X									
Blue Print	X		X							
Boiler Plant Maintenance										
Broadcasting								X		
Building Inspector						X				
Carpentry			X							
Cement Mason										
Commercial Vehicle Driving							X			
Construction										
Correctional Administration					X					
Cosmetology								X		

APPENDIX J (Continued)

Program	Institution									
	F	I	P	S	E	V	U	Q	A	C
Diesel Mechanic										
Drafting	X		X		X	X	X	X	X	
Drywall										
Electricity			X	X		X	X	X	X	
Fire Science	X		X	X		X	X	X	X	
Glazing										
Graphic Arts			X							
Gunsmithing					X					
Heavy Equipment Operator				X		X	X			
Interior Decoration			X							
Iron Worker							X			
Jig and Fixture								X		
Lathing										
Machinist	X		X	X		X	X	X		
Management		X								
Manufacturing and Assembly			X							
Marine Technician	X									
Meat Cutting								X		
Mill Cabinet										
Numerical Control	X									

APPENDIX J (Continued)

Program	Institution									
	F	I	P	S	E	V	U	Q	A	C
Paint and Decorating			X							
Pattern Making						X		X		
Photography	X	X						X		X
Plastics										
Plumbing			X	X			X	X		X
Police Science	X	X	X	X		X	X			
Power Sewing		X								
Printing		X						X		
Quantity Food			X							
Radio and TV Repair			X							
Restaurant										X
Roofing			X							
School Lunch						X				
Sheet Metal			X	X			X			
Small Engine Repair			X							
Social Service Technician										
Stagecraft									X	X
Surveying										
Taping										
Teacher's Aide										
Technical Illustration										X

APPENDIX J (Continued)

Program	Institution									
	F	I	P	S	E	V	U	Q	A	C
Technical Journalism										
Tile Setting										
Tool and Die								X		
Welding	X		X	X				X	X	

APPENDIX J (Continued)

OCCUPATIONAL PROGRAMS IN TRADES AND INDUSTRY
(Part 2)

Program	Institution								
	N	T	G	D	K	W	X	B	O
Air Conditioning	X			X	X				
Aircraft Maintenance				X					
Aircraft Operations				X				X	
Air Traffic Controller								X	
Auto Mechanic	X	X	X	X	X	X			X
Auto Body and Fender	X			X	X				X
Auto Service				X			X		
Barbering	X			X					
Blue Print	X								
Boiler Plant Paintenance	X								
Broadcasting									
Building Inspector						X			
Carpentry	X	X		X	X	X			
Cement Mason					X				
Commercial Vehicle Driving									
Construction					X				
Correctional Administration									
Cosmetology	X				X				

APPENDIX J (Continued)

Program	Institution								
	N	T	G	D	K	W	X	B	O
Diesel Mechanic				X					X
Drafting	X		X	X	X	X		X	X
Drywall	X						X		
Electricity	X			X		X	X		
Fire Science	X		X	X			X		
Glazing	X								
Graphic Arts		X		X			X		
Gunsmithing									
Heavy Equipment Operator	X			X			X		
Interior Decoration									
Iron Worker	X								
Jig and Fixture									
Lathing							X		
Machinist	X			X					X
Management	X				X			X	
Manufacturing and Assembly									
Marine Technician					X				
Meat Cutting	X								
Mill Cabinet	X			X	X				
Numerical Control									

APPENDIX J (Continued)

Program	Institution								
	N	T	G	D	K	W	X	B	O
Paint and Decorating				X			X		
Pattern Making									
Photography				X	X		X		
Plastics					X				
Plumbing	X			X			X		
Police Science		X		X	X	X	X	X	
Power Sewing									
Printing					X				
Quantity Food									
Radio and TV Repair				X			X		
Restaurant									
Roofing	X								
School Lunch									
Sheet Metal	X			X	X				
Small Engine Repair									
Social Service Technician					X				
Stagecraft									
Surveying							X		
Taping						X			
Teacher's Aide	X								
Technical Illustration						X	X	X	

APPENDIX J (Continued)

Program	Institution								
	N	T	G	D	K	W	X	B	O
Technical Journalism				X					
Tile Setting	X								
Tool and Die									
Welding	X		X						X